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U. S. DEPARTMENT OF
AGRICULTURE
FARMERS' BULLETIN No. 1457

PACKING
APPLES
IN BOXES



APPLE GROWERS in the far Western States were pioneers in packing apples in boxes. The box is their standard container, although a few bushel baskets have been used for apple shipments from certain sections.

For several years a limited number of eastern apple growers have packed apples in boxes, and the practice is becoming more extensive in some eastern apple sections.

A more detailed description of the equipment, management, and construction of boxed apple packing houses is contained in Farmers' Bulletin 1204, Northwestern Apple Packing Houses.

PACKING APPLES IN BOXES

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DEVELOPMENT OF WESTERN BOXED PACKING

THE WESTERN BOXED-APPLE INDUSTRY has developed to its present commercial importance mainly within the past 25 years. For the 6-year period ended in 1899 boxed apples constituted less than 5 per cent of the total production of the United States. For the 6-year period ended in 1923 boxed apples averaged about 30 per cent of the total.

Rapid development of domestic and foreign markets, in the face of the keenest competition from the old established apple regions, has been due in large measure to the reputation gained and maintained by the western box pack. Eastern districts still retain the barrel as the standard apple package, but there has been a gradual extension of western methods into this territory.

COMMUNITY PACKING HOUSES

A well-arranged and well-equipped packing house is necessary for efficient packing of boxed apples. A community packing house is especially desirable in a section that is beginning to pack apples in boxes if a group of growers by joining forces can finance the erection of a modern packing house. In such a house it is possible to perfect an organization of trained men to bring the grading and packing operation to a uniformly high standard. The cost of packing in such a house may not be so low as when the work is done by the individual, but it can usually be done more thoroughly and a more uniform pack is assured as inspection and responsibility are centralized.

CONSTRUCTION OF PACKING HOUSES

A convenient point either in the orchard or along a railroad siding is selected for the packing house. If packing and storage rooms are parts of the same building, the same building materials can be used in construction. Wood, concrete, brick, or tile is used, the choice of material being determined by cost and fire risk. The storage should be insulated and all illumination furnished by the use of artificial light. The packing room does not need insulation but often requires heating for the health and comfort of the employees.

Efficient work in the packing room is possible only when the room is properly illuminated at all times. Hipped-roof skylights installed over the sorting tables and side windows placed about 5 feet up the wall in sufficient numbers to light the interior thoroughly provide the most satisfactory method of lighting. (See fig. 1.) Where the house is constructed with a loft, light shafts or wells are used to admit light and to concentrate it over the sorting tables. White paint is applied to the ceiling and walls to intensify whatever light is available. Electric lights are necessary for use at night and on very dark days.

EQUIPMENT

The kind and amount of equipment for packing depend upon the size of the house, quantity of apples to be packed, and the preference of the management.



FIG. 1.—A community apple storage and packing house with adequate light in the packing room

HAND TABLES

Grading and sizing by hand are especially adapted for use in small packing houses, where the quantity of apples to run is small, and in large packing houses where many small lots of fruit must be packed at the same time. Through the use of hand tables it is easier to prevent stem punctures and slight bruises, and the expense of a machine is saved. As the fruit is sized by the packers, experienced and conscientious packers must be employed in order to put out a uniform-sized product.

In packing with hand tables the apples are sorted for grade directly into bins or compartments upon a packers' table from which they are packed into the boxes by the packer. The equipment used for hand operations consists of a sorting table, a packers' table, and a packing stand, all of frame construction. Where packers' tables as large as 4 feet wide and 8 feet long are used they should be constructed with padded solid bottoms which slope slightly toward the packers, the lower side being about 3 feet from the floor. If canvas or burlap is stretched for a top, it is likely to sag, with the result that the apples collect in the middle of the table at an inconvenient

distance from the packer. A crack an inch or so wide is provided at the lower end of the table to allow broken stems and other trash to fall through. This table is furnished with a padded flange around the sides 4 to 6 inches high. The padded partitions should be made movable so that the compartments for the various grades may be enlarged or contracted according to the needs of the lot of apples being run.

Apples are sorted and placed upon this table either directly from the orchard box or from a sorters' table about 4 feet long and 2 feet wide attached to the upper side of the packer's table. The sorters' table, which may also be square or somewhat fan-shaped, tilts slightly toward the packers' table, has sides about 4 inches high, is open at the lower end, and has a bottom made of padded slats to prevent bruising of the apples and to allow trash to fall through the cracks, or it may have a solid padded bottom. To reduce injury from careless dumping a canvas apron is attached to the edge of the sorter's table and placed over the box to prevent the apples from pouring out of the box with a rush. This unit will accommodate 2 sorters and 2 or 3 packers. A packers' table 5 feet long, 26 inches wide is preferred by some growers, since it eliminates the opportunity for a long throw by careless sorters and permits the packer to reach conveniently the apples at the far side of the table. Such a table will accommodate one packer and one or two sorters. Tossing the fruit should be discouraged, as it always results in more or less bruising.

SIZING MACHINES

Machines are used very extensively for sizing apples prior to packing (fig. 2). The advantages of the mechanical sizer are convenience and speed in sorting and boxing the crop and the uniformity of size which can be secured in any one box. Since the apples are sized for the packer, more inexperienced labor can be employed than in packing from hand tables where the fruit is sized by hand. The disadvantages are the expense of the equipment and the danger of punctures and slight bruises to the apples. Such packing injuries can be eliminated through the proper supervision of work on hand tables. Given the same excellent supervision to both hand tables and sizing machines, fewer injuries will occur when using the former. With poor supervision, however, more injuries are likely to result when packing on hand tables.

Sizing machines are provided either with a canvas sorting belt or with a roller sorting table composed of parallel wooden rolls wound in a spiral manner with sash cord. A feeding hopper or dumping table receives the fruit at one end of the machine. As it passes over the sorting table it is graded by hand and carried on various belts to the sizing unit, which delivers the apples into separate bins for packing. Most machines are about 6 feet 2 inches wide and vary from 26 to 52 feet in length, depending upon the make and capacity.

GRADING BELTS

With the improvement of mechanical sizers the use of grading belts has diminished in the boxed-apple districts, probably because most mechanical sizers have a larger output and because less experienced packers can be employed. The grading belt con-

sists of an endless canvas belt about 22 inches wide, run over a drum at each end approximately 15 inches in diameter. The belt is supported by a smooth board surface, and 2-inch strips are used to prevent apples from rolling off. The belt and board surface are supported by a wooden frame. The height of the belt is about 42 inches, and the usual width is 26 inches, including the frame. The fruit is fed to the belt by a short, sloping dumping table. The belt carries the ungraded fruit before the sorters, by whom it is sorted and distributed to various bins.

Excessive stem puncturing and bruises often occur, for the bins are usually large, allowing an accumulation of a large quantity of fruit and offering an opportunity for a long throw for the sorters. Grading belts are open to the objection mentioned for hand tables in that the packer does his own sizing and experienced packers must be employed to secure a uniform size in each box.



FIG. 2.—Sorting and packing with sizing machines

PACKING STANDS

The same general style of packing stand or box rack can be used for holding the boxes which are being packed, whether the packing is done from bins or a table or a machine. This stand is wide enough to accommodate the length of the box and long enough for as many boxes as are desired for packing into at the same time. The side next the packer is most convenient at such height that when the box is in place his fingers will just reach the bottom of the end of the nearest box. In order that the apples will stay in place when put in the box the stand is constructed about 6 inches higher at the back than at the front next the packer.

In packing from hand tables and grading belts when the fruit is not sized, either the packer has enough boxes in process of being packed so that he can pick up any apple nearest him and place it in one of them, or else he picks from the table all the apples of one size which he can see or which will fill one box, and then packs all of another size. In the former case the packer may use a stand long enough to run five or six boxes at the same time and even then, perhaps, lay aside the smallest and very largest apples.

When packing from bins of a sizing machine packers use a stand holding one box. It is often possible to pack more than one size from each bin, but such a practice is not customary except in packing from bins containing very large and very small sizes.

PAPER HOLDER

A holder or hod (fig. 3) is used for paper or wraps. Two angle hooks are screwed into one edge and a brace is attached underneath the hod to hold it in position. It is attached to the packing stand at the side of the box nearest the packer, or it is hooked upon the upper

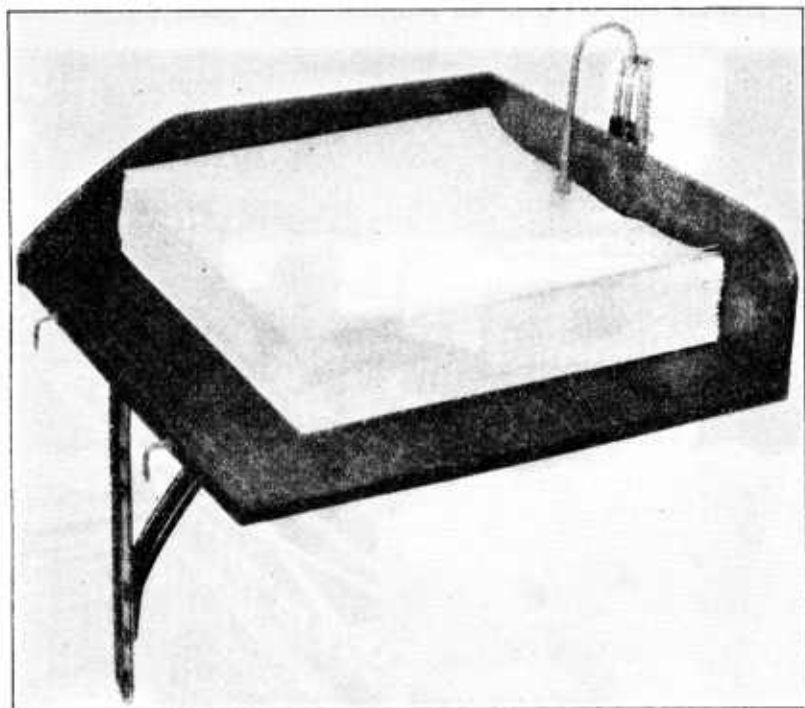


FIG. 3.—Paper hod used to hold supply of wraps for packing

head of one of his boxes. A "paper needle," which bears upon one edge of the paper with a spring, is attached to the side of the hod and holds the paper in place besides preventing more than one sheet being picked up at once.

PAPER RACKS

To prevent waste of wraps racks of some sort are necessary so that the supply will be handy for the packers. These racks are usually placed underneath the bins, each size of wrap being located adjacent to bin where used. In some cases racks may be placed on the walls along the sides of the packing room.

CONVEYING EQUIPMENT

Gravity conveyors are used in most packing houses, as such equipment has proved essential to the economical handling of boxed

apples. Sections of conveyors are used in unloading loose fruit from the orchard wagon and in handling the fruit from the loose-fruit storage to the sorters, from the packers' stands to the lidding presses (fig. 4), and from there to the packed-fruit storage or into the car for shipment.

A few houses are equipped with moving belts and gravity conveyors, which handle the boxes throughout the packing house and storage.

Inclined belts, provided with cleats to prevent the boxes from slipping or upsetting when traveling up or down a relatively steep pitch, are used for lowering or elevating the fruit. Such belts travel over and are supported by an iron-covered or plain smooth board.

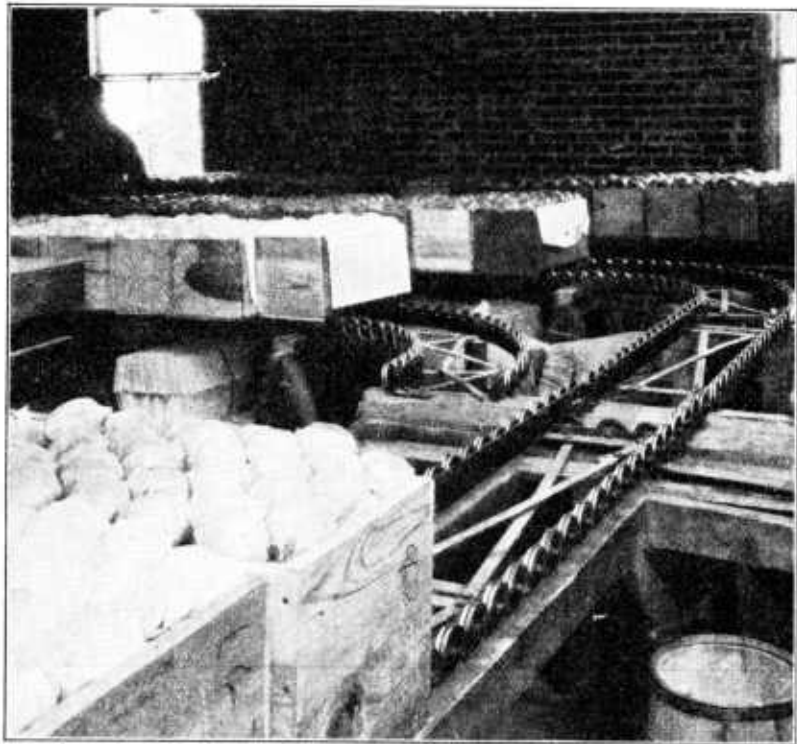


FIG. 4.—Moving packed boxes to the lidding presses on gravity conveyor

When the pitch is very steep or economy of space is desired, inclined elevators carrying the box in an upright position may be purchased. Such elevators, which can be reversed, can be operated at an angle of 30° from the perpendicular.

Two-wheel hand-grip trucks of a special design are used for moving stacks of boxed apples. Most of the houses use a few such trucks, although the greater part of the handling in the larger packing houses is done on gravity conveyors and belts.

LIDDING PRESSES

After packing, the covers are drawn into place by a lidding press and nailed. Of the several types manufactured those constructed of iron or steel are most satisfactory, as they can be used for several

years without repress. In Figure 5 is shown a desirable type of lidding press. At the right is an unlidded packed box as it comes from the packer. In the press is a box with lid drawn into place and ready to receive the cleats. On the left are lidded boxes ready to be conveyed to stage or car. A shelf on the press holds the nail stripper, hatchet, ls. and cleats.

BOX-MAKING BENCH

A bench upon which boxes are made up is necessary equipment. Some growers prefer to purchase an iron form mounted on a wooden bench, such as is shown in Figure 6. Many growers use a homemade

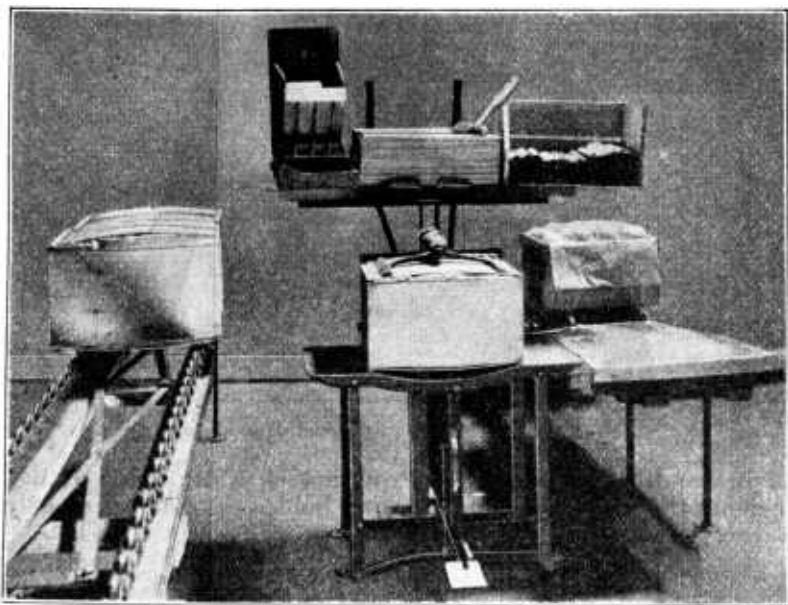


FIG. 5.—A desirable type of lidding press showing arrangement of nailer's equipment and supplies, and boxes in process of lidding

bench similar to the one illustrated in Figure 7 (A-B). Thirty-two five-penny cement-coated box nails are used in making up each box. Four nails are driven through each end of the pieces which form the top, bottom, and sides. In nailing the top or bottom, a cleat is placed at each end and the nails are driven through cleat and top or bottom. Boxes are usually made up well in advance of the packing season.

MISCELLANEOUS EQUIPMENT

An automatic nail stripper (fig. 8), which delivers nails in convenient arrangement for holding between the thumb and first finger, is indispensable if nailing operations are to be done speedily. Powdered soapstone is often poured over the nails so that they will slide more easily into the grooves on the face of the stripper.

Box hatchets similar to a lather's hatchet are used in making up and lidding boxes and for nailing strips of lath between stacks of boxes when loading cars.

When boxes are exported they should be wed or strapped (fig. 9) at each end just inside the cleats to prevent breakage in transit

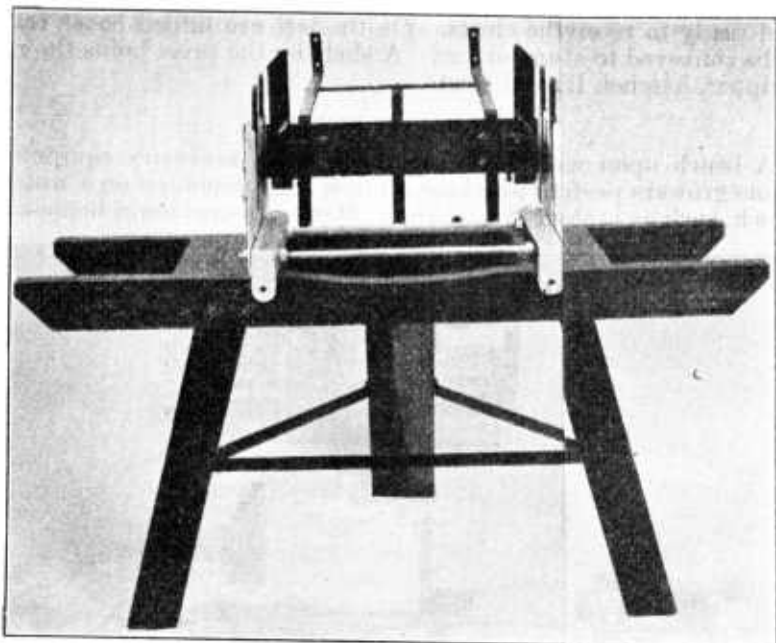


FIG. 6.—Iron form for box making mounted on a wooden bench

and in handling at shipside. Provision is usually made at docks for doing the work, but many packing houses that conduct an exten-

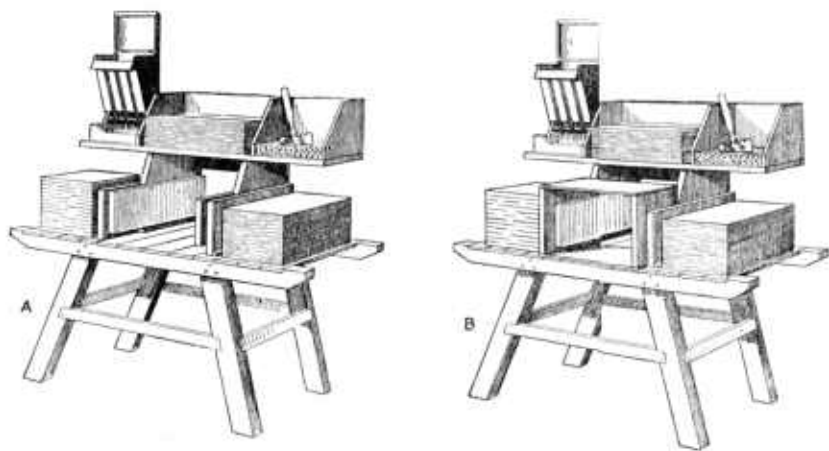


FIG. 7.—A wooden box-making form and bench showing convenient arrangement of box materials and nail stripper, before ends are placed in position for nailing, and with ends in place and one side nailed.

sive export business find it profitable to buy a wiring or strapping machine and do the work at the packing house.

SUPPLIES

APPLE-BOX MATERIALS

The apple box which is standard in the boxed-apple section of the Northwestern States and California is 18 inches long, 11½ inches wide, 10½ inches deep, inside measurements, and contains 2,173 cubic inches exclusive of the bulge, or 23 cubic inches more than the struck United States standard bushel. The bulge usually is figured as containing 150 cubic inches.



FIG. 8.—Nail stripper and hatchet for nailing operations

The following are specifications for apple-box shooks:

Ends, ¾ inch or ⅝ inch by 10½ inches by 11½ inches, 2 pieces	20 to bundle.
Sides, ⅝ inch by 10½ inches by 19½ inches or 19¾ inches, 2 pieces	40 to bundle.
Top and bottoms, ¼ inch by 5½ inches by 19½ inches or 19¾ inches, 4 pieces	100 to bundle.
Cleats, ⅝ inch by ¾ inch by 11½ inches, 4 pieces	100 to bundle.

Spruce and pine are two common woods used and make very satisfactory boxes. All box material, except the cleats, should be surfaced at least on one side. The cleats are soaked before nailing to prevent splitting.

WRAPPING PAPER

It is advisable to wrap all boxed apples, except the very small sizes (198's or smaller), which are often placed without order in the boxes and are known as jumble packs. If small apples are exported, they are usually wrapped. The wraps make it easier to pack, aid in protecting the apples from bruising and in preventing the spread of decay, keep the fruit clean, make a more sanitary package, and

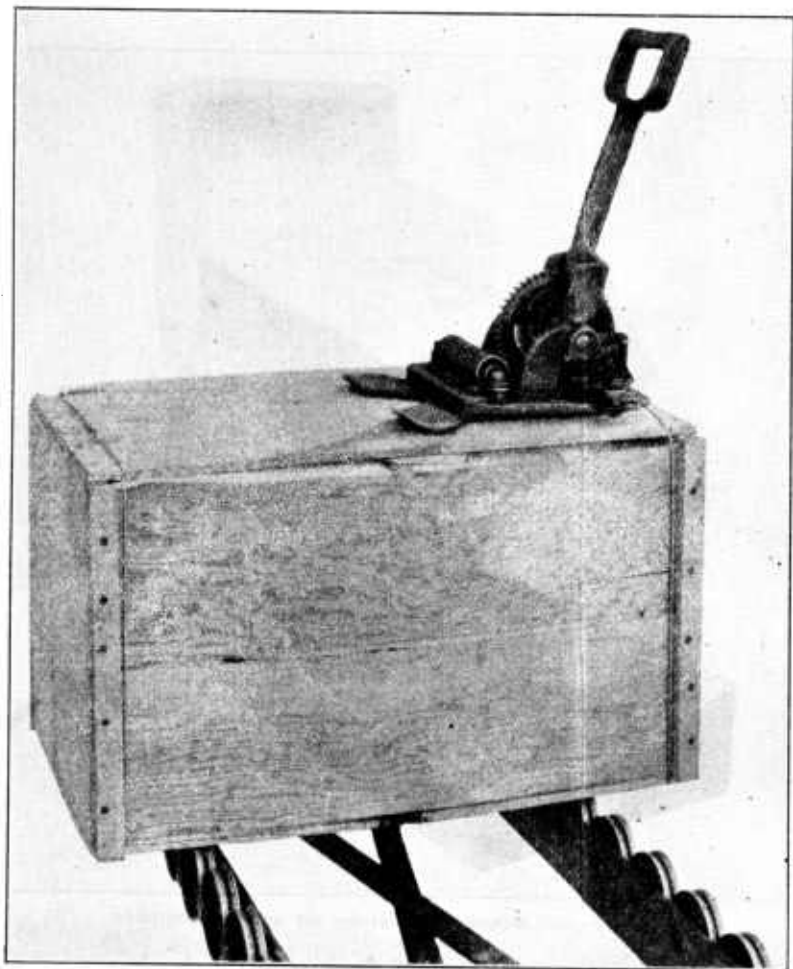


FIG. 9.—Wiring a box for export

indicate to the buyer that care has been exercised in preparing the fruit for market.

Twelve or fourteen-pound paper, smooth or glazed on one side, is used for wrapping apples. The wraps are shipped in bundles of about 50 pounds. Some are sold with a specified number of sheets to the bundle. Oiled wraps are now extensively used on varieties to be stored, as a preventive against scald. For apples of sizes 56 and larger, 12 by 12-inch or 14 by 14-inch wraps are used, 11 by 11-inch

for sizes 64 to 80, 10 by 10-inch for sizes 88 to 113, 9 by 9-inch for sizes 125 to 180, and 8 by 8-inch for sizes 198 and smaller.

LINING PAPER

Lining paper for the boxes is used with the better grades of apples. Two sheets 17½ by 26 inches are required for each box. Some packing houses use white, blue, and pink liners for different grades of apples. Thirty-two pound newsprint or 20-pound sulfide paper is generally used for this purpose. The latter costs more per pound but is stated to cost no more per box because there are more sheets to the pound.

STAMPS

Each packing house should have a supply of rubber stamps and ink pads. After the apples are packed, but before the boxes are lidded, the variety, grade, numerical count, and minimum net weight are stamped with either violet or purple ink on the end of the box directly above the label. Some shippers also include the packer's number and the grower's name. The stamping is done by the packer, the liddler, or by some one whose whole time is devoted to this work.

Many packing houses use a self-inking stamping machine attached to one side of the lidding press and operated by the liddler. The number and gradestamps are on rubber bands stretched over rollers, and are set by means of knobs which turn the rollers. Stamps for variety, grower's name and address and weight are held in place by spring clips and may be quickly changed. The stamps are all in straight alignment and the lettering is distinct.

LABELS

The labeling of boxes has become a standard practice in the boxed-apple section. Packing houses should have a supply of labels using different color combinations for the various grades to be packed. A blue label is commonly used for the extra fancy grade, red for the fancy grade, and white for the C grade. A good label is neat, simple, attractive, and should indicate the character of the product. It should be large enough to cover the end of the box to within 1½ or 1¾ inches of the top, this space being required to insure that the stamping will not be covered by the label. Only the best grade of paste should be used, and it should be remembered in applying the labels that if the paste touches the stamp marks the ink will run and make them indistinct. Labeling can be done in either the storage or car. If the boxes will remain in storage long enough for the labels to dry, the work should be done there; when the work is done in the car it often results in torn labels and is more expensive, because the labeler is in the way of the car loaders and is often idle when the loaders are stacking the boxes.

SKETCHING THE OPERATIONS

To line a box, a sheet of paper is placed in such a way that it reaches about two-thirds across the bottom, comes up the side, and is bent back over the outside of the box. In a like manner a second sheet of lining paper is placed on the opposite side of the box and overlapping the first on the bottom. The bottom corners of these sheets often tear when the lid is forced into position for nailing unless the packer has made folds in the papers at these points. Be-

fore placing a lid, the loose ends of the paper are brought together over the top of the fruit so they overlap.

If the apples have been sized, the pack to be used for the size of apples in the bin should be determined. This is done by placing some of them on their cheeks in the end of the box with the stem end of the apples all pointing away from or all toward the packer. If 2, but not quite 3, apples are needed to span the width of the box, it will be a 2-1 pack. If 3, but not quite 4, apples are needed to span the width of the box, it will be a 2-2 pack. If 4, but not quite 5, apples are needed to span the width of the box, it will be a 3-2 pack. If 5, but not quite 6, apples are needed to span the width of the box, it will be a 3-3 pack.

If the apples in the bin have not been sized, the packer should run as many boxes as are necessary to secure a uniform size in each box. After deciding upon the style of pack to be used for the box the packer is ready to begin packing the first layer. Wrap the apples so that the wrap is neat and tight. Place the apples in the box with the stems all pointing toward one end of the box in a correct alignment. Each apple in the last row should touch the end of the box. In packing succeeding layers be sure that the center of each apple is over the center of the pocket or depression formed by the apples in the lower layer. In case the packer has to do his own sizing, expertness has to be acquired in selecting apples of just the right size for the various counts, so that the pack will not come too high or too low. Guard against packs with ends too high, and consequent danger of slicing or partial crushing of the end apples.

METHOD OF WRAPPING

The wraps are in the paper holder, glazed side up. A rubber finger stall is worn on the forefinger of the left hand, as by its use single wraps are picked up easily (fig. 10, A). The wrap is picked up with the left hand, one corner pointing toward the packer, the center of the wrap in the center of the palm. At the same time an apple is picked up with the right hand (fig. 10, B).

The apple is thrown into the wrap with some force (fig. 10, C) in order to jerk up the edges of the wrap around the apple. The apple strikes on its cheek in the center of the wrap (fig. 10, D) with its stem end pointing midway between the thumb and index finger. As the apple is caught the thumb and fingers of the left hand are closed about the apple, forming a cup, and remain in this cupped position throughout the wrapping process. As the apple is thrown the right hand advances toward the blossom end of the fruit with fingers together and thumb extended at nearly right angles to fingers. The index finger is up and the little finger is down (fig. 10, E). The lower corners of the wrap are brushed closely over the apple with the thumb and forefinger of the right hand, bringing all corners of the wrap tightly together at the top, except the corner between the thumb and forefinger of the left hand (fig. 10 F).

Now, holding the apple tightly within the wrap with the thumb and forefinger of the right hand, both wrists are twisted toward the right. The apple turns within the cup formed by the left hand, the fingers of the left hand moving between the apple and the fingers

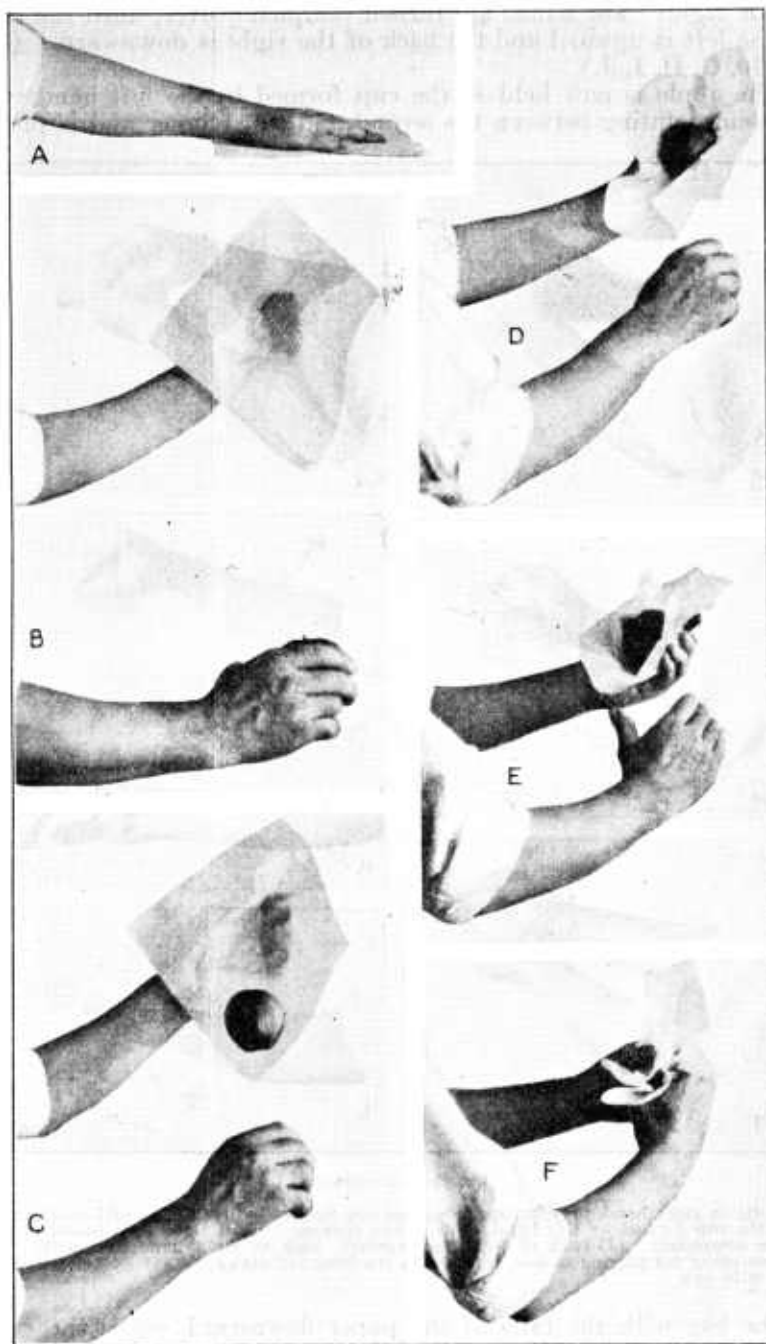


FIG. 10.—Method of wrapping an apple: (A) Picking up the wrap; (B) picking up the apple; (C) throwing the apple into the wrap; (D) position of apple upon striking wrap; (E) wrapping process, first stage; (F) wrapping process, second stage; (G) apple held

of the right. The hands are turned completely over, until the back of the left is upward and the back of the right is downward. (See fig. 10, G, H, I, J.)

The apple is now held in the cup formed by the left hand with its stem pointing between the second and third finger and is placed

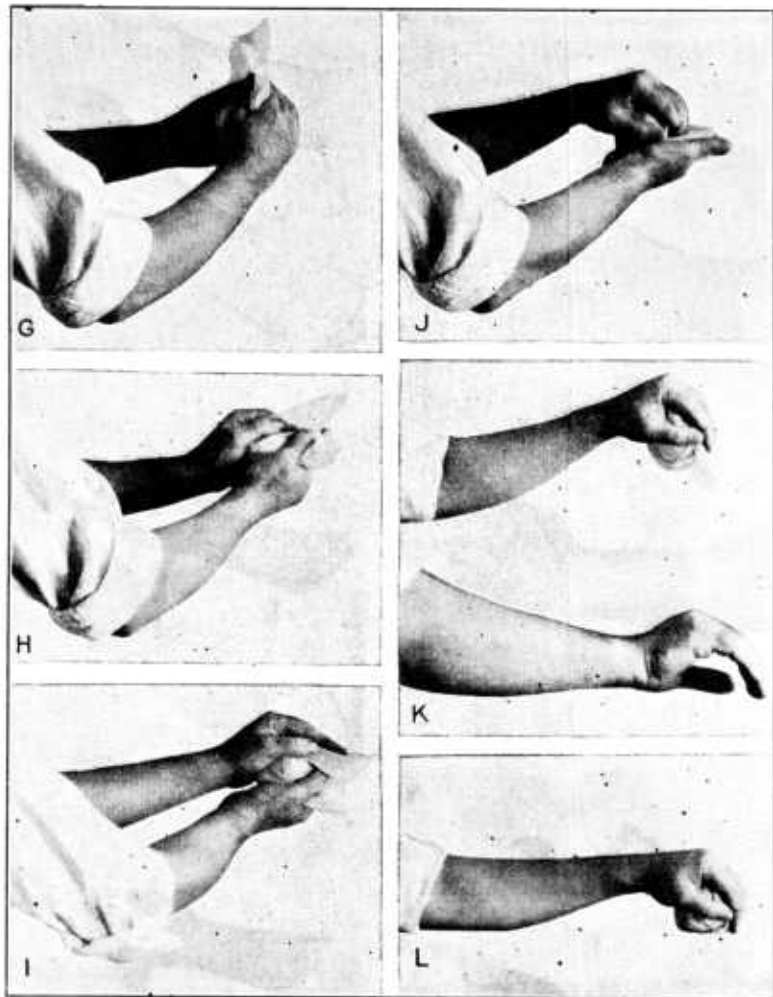


FIG. 10.—Continued

tightly in right hand, pressing apple against cup formed by left hand; (H) apple turned within cup formed by left hand, both wrists turning toward right; (I) hands turning over completely; (J) back of left hand upward, back of right hand downward; (K) apple ready for placing in box, right hand reaching for next apple; (L) placing wrapped apple in box

in the box with the tails of the paper downward, while the right hand reaches for another apple (fig. 10, K, L). The positions as shown in Figure 10 are described in detail, but it must be understood that, when wrapping, these positions blend into each other so rapidly that an expert packer appears to be picking up apples with

his right hand and paper with his left, and placing the wrapped apple in the box. It is readily seen that if the wrap is picked up with the right hand and the apple with the left the motions would be reversed. Most apple packers use the general method described, although there are some variations in the details. Beginners should be warned against forming habits in the operations which result in lost motion, for such habits are difficult to overcome. Experienced packers will pack apples about as fast as they can pick them out of the bins. The average packer will pack from 100 to 125 boxes of machine-sized fruit in a day, but packers have been known to pack 325 boxes in 10 hours.

APPLE PACKS

Many styles and counts of packs have been used for boxing apples. Those described and illustrated are recommended, for by their use damage from stem punctures and bruises is decreased as compared with other styles and counts. These packs are here tabulated for the purpose of ready reference.

Apple packs

Style of pack (cross-wise)	Number in rows (length-wise)	Number of layers (depth)	Size or count	Style of pack (cross-wise)	Number in rows (length-wise)	Number of layers (depth)	Size or count
2-1	4-4	3	36	3-2	5-5	5	125
2-1	5-4	3	41	3-2	6-5	5	138
2-2	3-3	4	48	3-2	6-6	5	150
2-2	4-3	4	56	3-2	7-6	5	163
2-2	4-4	4	64	3-2	7-7	^c 5	175
2-2	5-4	4	72	3-3	5-5	^d 6	180
2-2	5-5	4	80	3-3	6-5	6	198
2-2	6-5	^a 4	88	3-3	6-6	6	216
3-2	4-3	^b 5	88	3-3	7-6	6	234
3-2	4-4	5	100	3-3	7-7	6	252
3-2	5-4	5	113				

^aFor flat apples.

^bFor long apples.

^cFlat apples only.

^dAll apples.

TWO-ONE PACK

Occasionally apples grow so large that they may be packed 2-1. (See fig. 11, *A*.) This pack is begun by placing an apple upon the bottom of the box in each corner and a third between the two, the third apple being of such size that it will not slip much more than halfway into the space between the first two apples. The bottom layer is filled out with apples in the same relative position as the first three. The second layer is begun by placing an apple in the space or pocket formed by the first three apples of the first layer. The apples in the second and third layers are placed over the spaces in the layers below. Three layers of the 2-1 pack fill the box. Rather than try to pack apples into the 2-1 pack, however, a more uniformly tight pack can usually be secured by mixing sizes a little and packing the apples 2-2.

TWO-TWO PACK

The 2-2 pack (fig. 11, *B*) is begun by placing an apple upon the bottom of the box in one corner and another midway between this

apple and the other corner. The third apple is placed in the space between the first and second apples, and the fourth is placed in the space between the second apple and side of the box. All four apples will be of such size that the third and fourth will not slip more than halfway into the spaces left by the first two. The bottom layer is filled out with apples in the same relative position as the first four. The second layer is begun by placing two apples above the spaces in the first layer next the lower end of the box, continuing as in the first layer, the apples in the second and in each succeeding layer being placed over the spaces in the layer below. Four layers of the 2-2 pack fill the box.

THREE-TWO PACK

To start the 3-2 pack an apple is placed in each lower corner of the box and a third midway between the two (fig. 11, *C*). Two

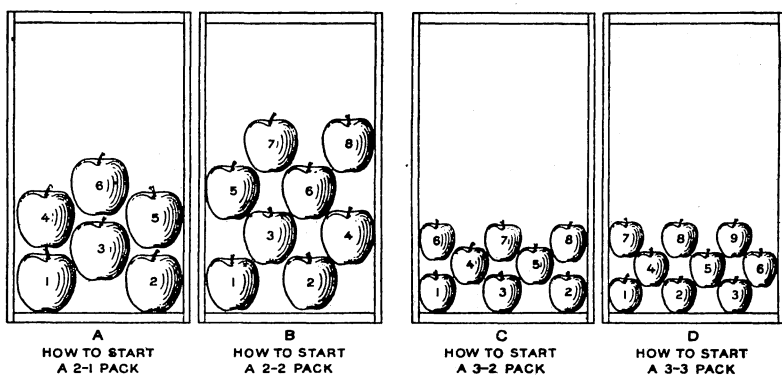


FIG. 11.—Diagram illustrating method of starting each style of pack

more apples are placed upon the bottom of the box in the two spaces formed by the first three. The five will be of such size that the last two will not slip more than halfway into the spaces left by the first three. The bottom layer is filled out with apples in the same relative position as the first five. The layer may be finished at the upper end of the box with either two or three apples. The second layer is begun by placing two apples above the spaces in the first layer next the lower end of the box, continuing as in the first layer, the apples in the second and each succeeding layers being placed over the spaces in the layer below. Five layers of the 3-2 pack fill the box.

THREE-THREE PACK

The 3-3 pack (fig. 11, *D*) is begun by placing an apple in one lower corner of the box and dividing the remaining space across the box equally with two other apples, leaving a space in the corner of the box opposite from that in which the first apple is placed. Three other apples are placed upon the bottom of the box in the three spaces formed by the first three apples, the six being of such size that the second three will not slip more than halfway into the three spaces formed by the first three apples. The bottom layer is

filled out with apples in the same relative position as the first six. The apples in each succeeding layer are placed over the spaces in the layer below. Six layers of the 3-3 pack fill the box.

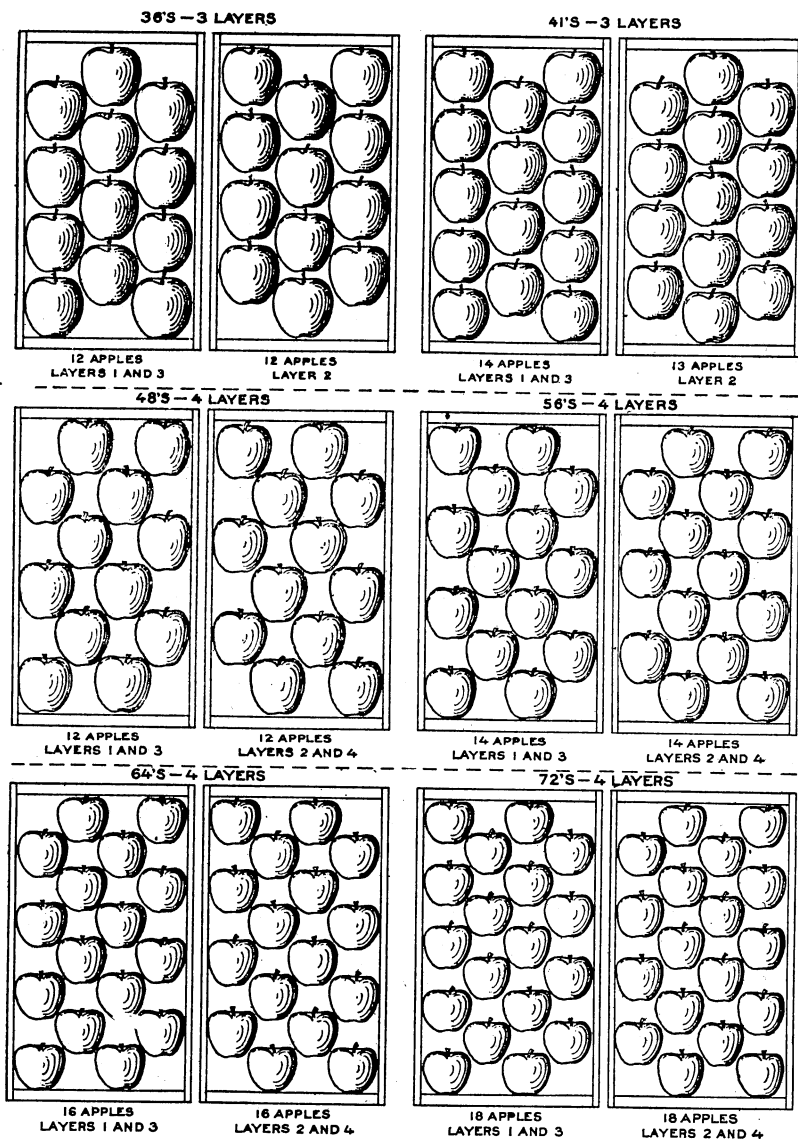


FIG. 12.—Diagram illustrating the arrangement and method of packing sizes 36 to 72 in layers in standard boxes. The number of apples in each box and the number of layers are given above each diagram. The number of fruits in each layer is shown below the diagram

DIAGRAM OF PACKS

Figures 12-15 give a diagrammatic illustration of the method of placing the apples of various sizes in the box. The arrangement as shown in the left-hand illustration of each size is that for the first

or the bottom layer; the one on the right is the second layer, which is on top of the first. The third is the same as the first, and the fourth is the same as the second, and so on. Certain sizes are some-

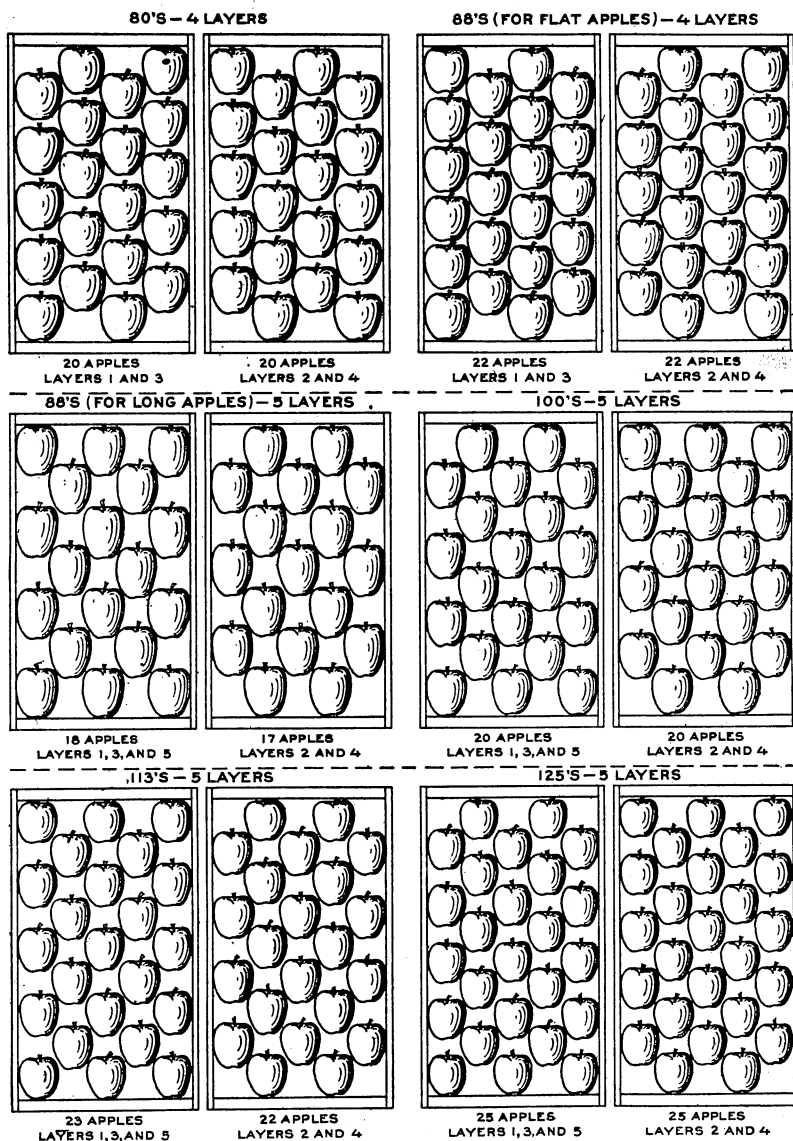


FIG. 13.—Diagram illustrating the arrangement and method of packing sizes 80 to 125 in standard boxes. The number of apples in each box and the number of layers are given above each diagram. The number of fruits in each layer is shown below the diagram

times packed differently from the arrangement shown in the diagram, the packs here illustrated being the ones more commonly used and preferred at the present time.

DETERMINING THE COUNT

The number of apples in the box can usually be determined by counting the number of apples in the top layer and multiplying by

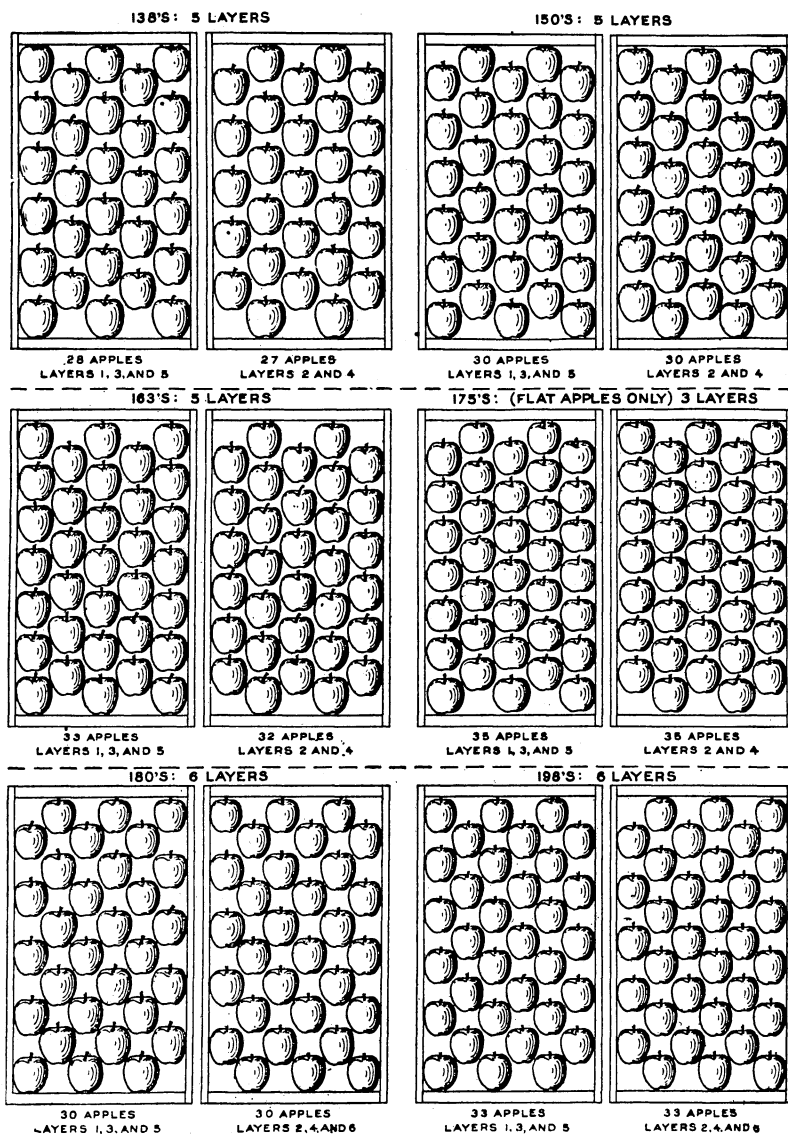


FIG. 14.—Diagram illustrating the arrangement and method of packing sizes 138 to 198 in layers in standard boxes. The number of apples in each box and the number of layers are given above each diagram. The number of fruits in each layer is shown below the diagram

the number of layers in the box. There are, however, certain exceptions in the 2-1 and 3-2 styles of pack.

When the rows lengthwise of the box in the 2-1 pack do not contain the same number of apples, the second layer will have one less

apple than the top and bottom layers; therefore, to determine the count, multiply the number of apples in the top layer by 3 and subtract 1; 41's are an example.

When the rows lengthwise of the box in the 3-2 pack do not contain the same number of apples, the second and fourth layers contain one less apple than the first, third, and fifth layers. In these cases, multiply the number of apples in the top layer by 5 and subtract 2 in order to determine the number of apples in the box, as 88's, 113's, 138's, and 163's.

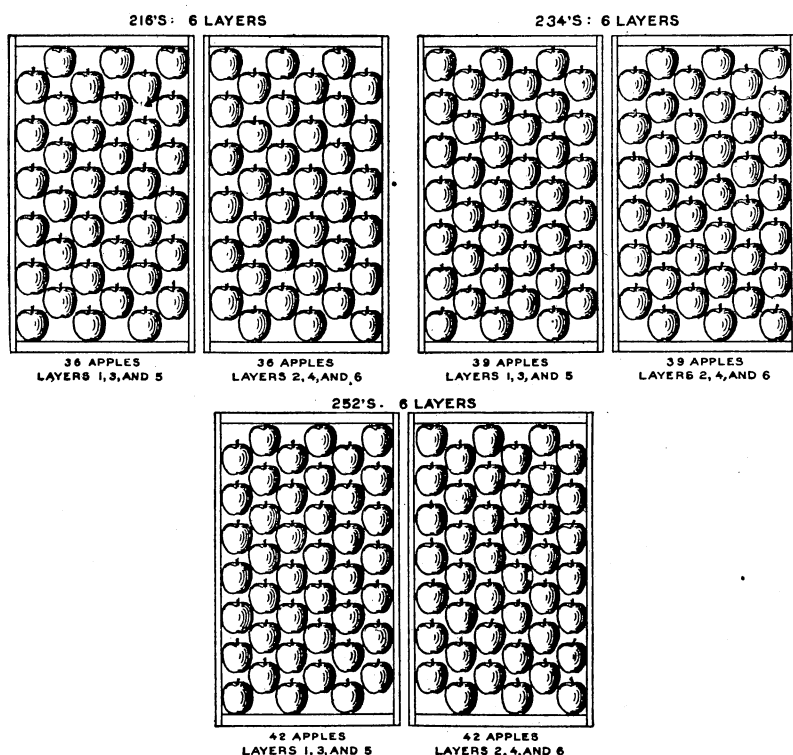


FIG. 15.—Diagram illustrating the arrangement and method of packing sizes 216 to 252 in layers in standard boxes. The number of apples in each box and the number of layers are given above each diagram. The number of fruits in each layer is shown below the diagram

BULGE

The purpose of the bulge is to hold the apples tight in the box during storage and transportation to market, as the fruit generally shrinks during these operations. The customary bulge upon a lidded box of apples varies from one-half to three-fourths of an inch, both top and bottom. The packing regulations enforced by some States require a minimum bulge of one-half inch. The packs should not be built too high, as undue bruising or slicing of the apples will occur in lidding. The bulge is secured by building the pack up in the middle, about $1\frac{1}{2}$ inches above the side edges of the box, while the ends of the pack are brought lower (about one-fourth to three-eighths of an inch above the ends of the box.) (Fig. 16.)

One of the best methods of securing a bulge is to pack the first two and last two end rows of each layer with the apples having their shortest diameter, as measured from cheek to cheek, perpendicular to the bottom of the box.

Considerable difficulty is often encountered in obtaining the correct height of pack unless the packer regulates the tightness of the pack in accordance with the size of the apples for a given style of pack. In packing the larger sizes of any style of pack, crowding of the

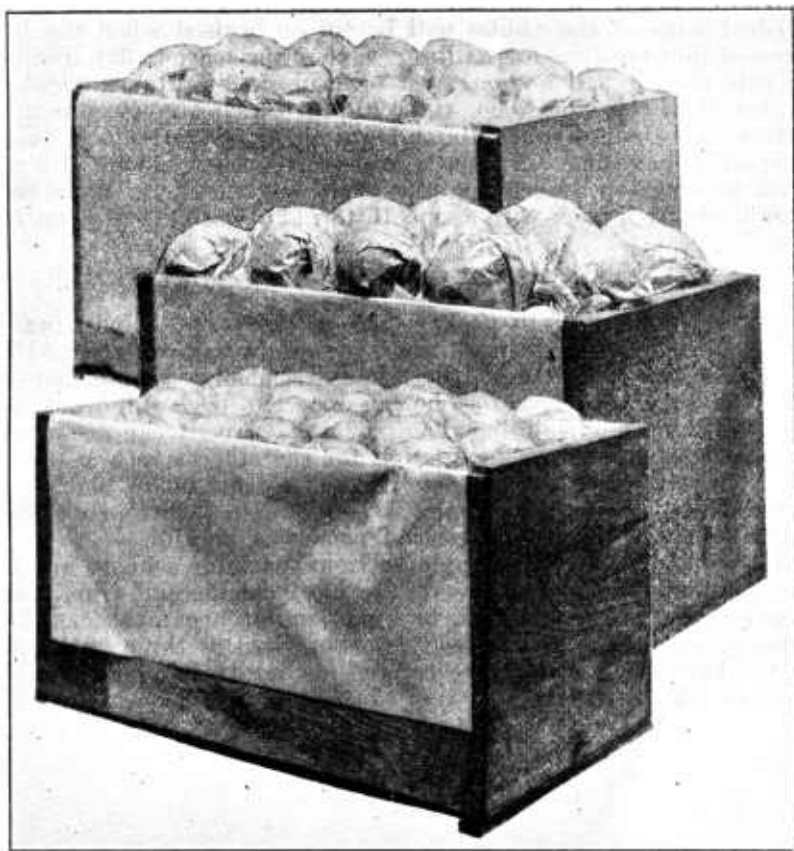


FIG. 16.—Upper box shows correct height and proper bulge; middle box is packed too high; bottom box is packed too low

apples will result in a pack which is too high, but in packing the smaller sizes of any style of pack the pack will be too low unless it is very tight. This tightness is secured by drawing down the apples in the bottom layer two or three times as the layer progresses. For example, 88's and 100's are the largest of the 3-2 pack, and such apples should not be packed too tight; 163's and 175's are the smallest sizes of this style, and the bottom layer should be drawn toward the packer, resulting in a tighter pack through the entire box than with the largest sizes.

A variation in the proper height of the apples in the unlidded box will also occur, depending upon the weight and size of wraps used and the strength of the packer. The strength used determines whether the folds of the paper are pressed down as the packer places the apples into the box, causing them to sink at once their eventual depths into their pockets.

EVENNESS OF TOP

An evenness of the top layer is necessary. If this is not accomplished some of the apples will be cut or bruised when the lid is pressed into position for nailing. Unless the pack is flat from side to side the lid will not only cut or bruise those apples which are higher than the others, but those apples which are lower than the others and do not touch the lid are likely to rattle and become bruised in handling. Although an expert packer can build a pack with an even top by using apples of an uneven size, still the surest way to secure a pack with a smooth top is to use apples of uniform size.

EXPERIENCE AND INSTRUCTION IMPORTANT

Before attempting to pack apples in boxes one should practice until he has developed the ability to wrap apples properly. At first he should not aim at speed but should remember that he must be able to wrap properly before he can expect to pack rapidly or well. The importance of building the first layer correctly can not be over-emphasized, as it is the foundation for the other layers in the box. With most beginners expertness has to be acquired in placing this layer without having the apples twist sidewise. Obviously individual instruction by an experienced packer is helpful.

In some of the boxed-apple sections packing schools are held each fall under the auspices of the local commercial club, Young Men's Christian Association, or some similar organization. These schools, which are usually held for about two or three weeks prior to the harvesting season, are responsible for training many of the western apple packers.

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